CHAPTER 1. INTRODUCTION

Study Context

In July 2002, BART, the Alameda County Congestion Management Agency and a consultant team led by Cambridge Systematics completed a major effort exploring possible transit extensions from the Dublin/Pleasanton BART station to Livermore. That study examined a variety of transit technologies and alignments, but none of its rail alternatives met regional or national cost-per-new-rider criteria, nor could they be constructed with known financial resources. Nevertheless, it provided important travel demand data that suggested a workable transit extension was possible, and it recommended that several specific opportunities be explored in more detail in a Phase 2 study.

This document is the result of that Phase 2 study. In order to maximize ridership and minimize cost, it uses the travel demand data from the Phase 1 study to create transit alternatives that directly respond to the actual trip patterns of residents and employees of the Livermore Valley. More importantly, it incorporates the travel patterns of the entire Bay Area and Central Valley, with a particular focus on an 'L' shaped corridor from Walnut Creek to Tracy. Specifically, this study differs from the Phase 1 study in that it:

- Expands the study area to include the I-680 corridor as far as Walnut Creek, capturing the high volume of Livermore-Amador Valley residents who work in places such as Bishop Ranch and downtown Walnut Creek.
- Expands the study area to include Tracy, capturing the high volume of Central Valley residents who work in the Tri-Valley, and intercepting commuters bound for the core BART system before they reach Altamont Pass.
- Analyzes lower cost transit technologies in greater detail, including two types of Diesel Multiple Unit (DMU) trains and a new form of Bus Rapid Transit (BRT).
- Provides a more sensitive Travel Demand Analysis
- Adds more detailed analysis of potential Transit Oriented Development (TOD).
- Focuses on corridors with the greatest density and potential ridership

- Attempts to capture four specific travel markets:

  1. Transfers to BART: Central Valley and Tri-Valley commuters who want to transfer to the core BART system
  2. Intra-Tri-Valley: local residents who commute to jobs in the Tri-Valley
  3. To Tri-Valley: Central Valley residents who commute to jobs in the Tri-Valley
  4. "Reverse Commuters": workers who use the core BART system to reach jobs in the Tri-Valley

Phase 1 Study

The Phase 1 I-580 BART to Livermore Study was designed to determine the most feasible and effective transit solutions to connect BART to Livermore and reduce congestion on I-580.

Travel Market

The Phase 1 study carefully examined the projected travel demand in the year 2020 for commuters living in Livermore and for commuters living in the Central Valley and driving over the Altamont Pass. The data suggested strong conclusions about the ability of transit to reduce congestion in the corridor:

- **Short Commutes**: About 46% of Livermore residents commute to nearby jobs in Dublin, Pleasanton and San Ramon. The low density, auto oriented nature of the Tri-Valley makes these trips difficult to capture, since both the trip origins and destinations are widely scattered. However, even a small share of this travel market would provide substantial transit ridership. To capture these trips – the largest share of the total market – a network of rapid transit services would be necessary, along with land use changes that concentrated employment areas, increased densities in key corridors, and introduced Transportation Demand Management measures such as parking fees.

Figure 1-1
Phase 1 Travel Demand: 255,800 Weekday Trips to/from Livermore in 2020

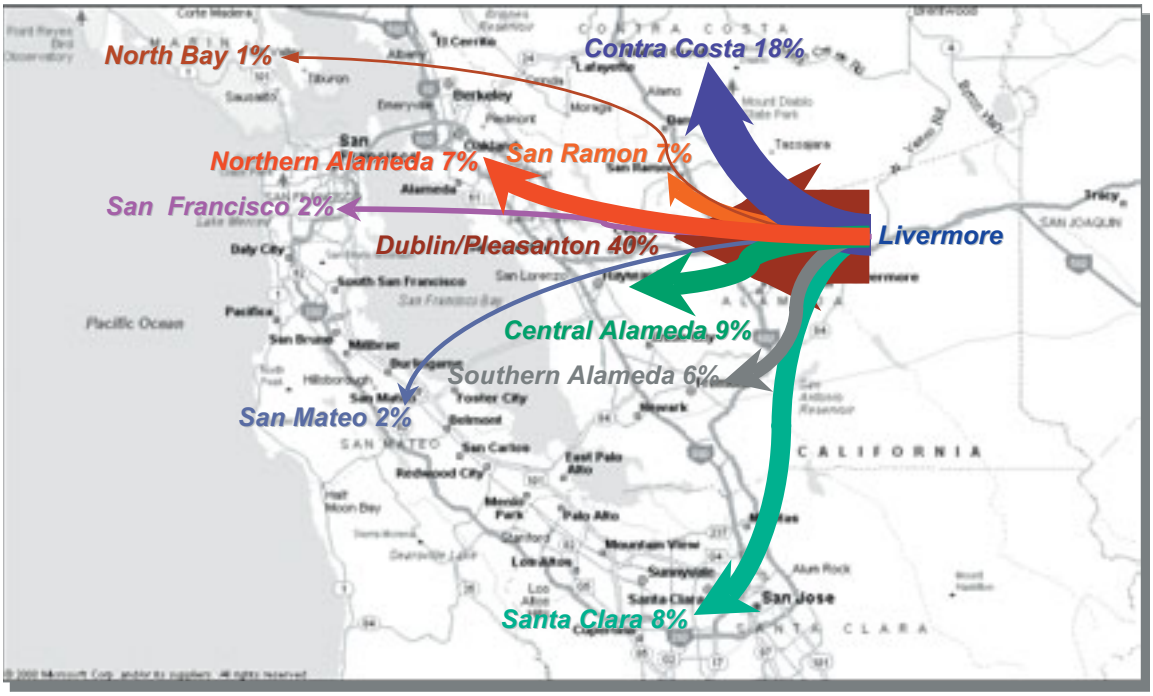
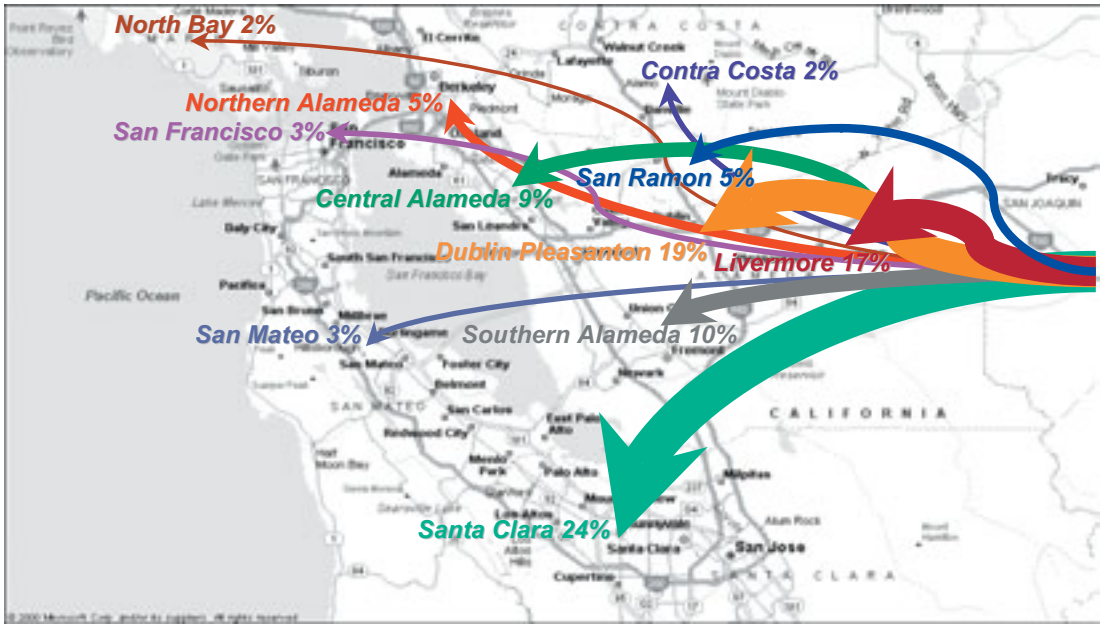
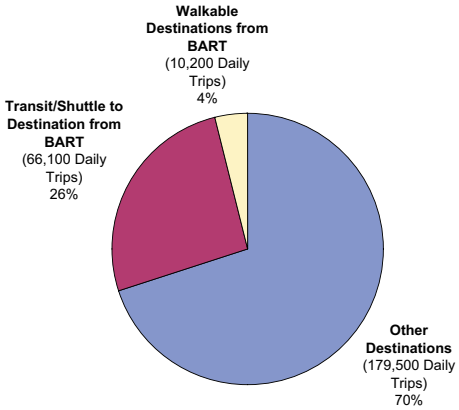


Figure 1-2
Phase 1 Travel Demand: 95,200 Weekday Trips to/from Altamont in 2020



- **Employment Far From BART:** In 2020, only 4% of Livermore residents are projected to work in locations within walking distance of core BART stations. These jobs are primarily in downtown San Francisco, and BART already captures over a third of this market. In order to capture more Livermore commuters, improved transit options would need to be created to serve key employment destinations such as Bishop Ranch, Walnut Creek and the South Bay.
- **BART Does Not Serve Central Valley Commute:** Among Central Valley residents commuting over the Altamont Pass, 41% travel to jobs in the Tri-Valley and 24% travel to jobs in Santa Clara County, places where BART provides limited service. Fewer than 8% commute into downtown Oakland and San Francisco, and BART is already capturing 48% of this market.
- **Complex Travel Patterns:** The travel patterns of the Tri-Valley are very complex – too complex for a single BART extension along a single corridor to serve well.
- **Low Densities:** Few jobs centers or residential areas in the Tri-Valley are built at densities or with land use patterns that support the use of transit. Such patterns significantly increase the cost of transit services and require that service frequencies be so low that transit is not attractive to people who have access to a car.



How Many of the 255,800 Trips from Livermore in 2020 Go to BART Accessible Markets?

Phase 1 Alternatives

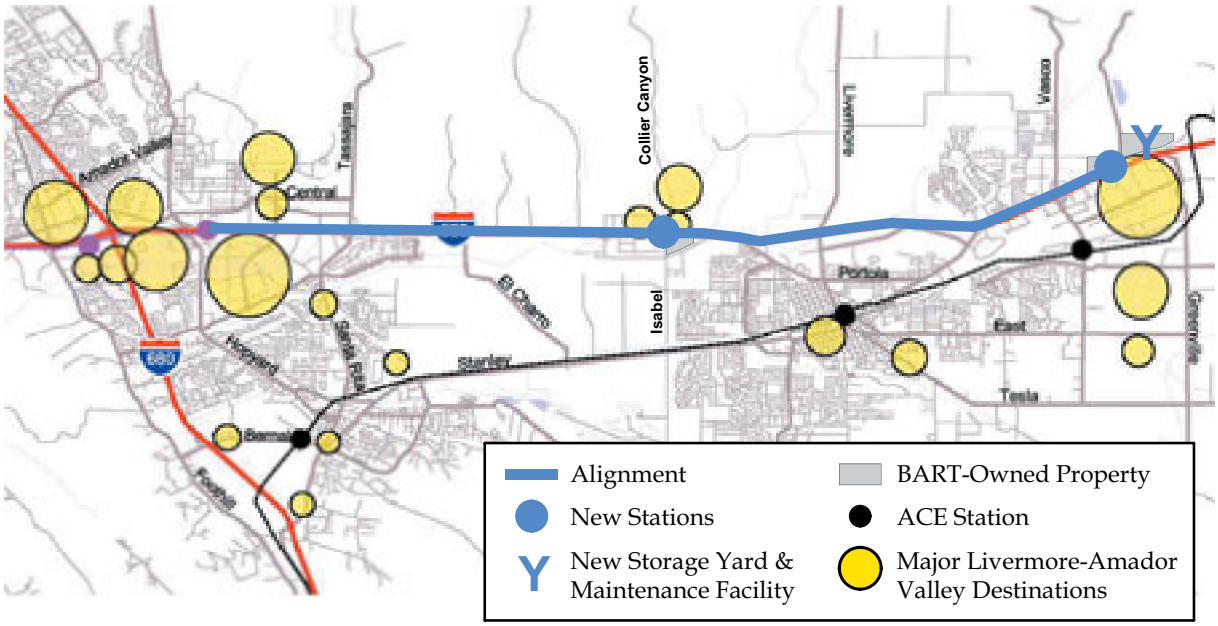
The study considered six alternative routes and technology options, as well as four iterations of those alternatives that projected substantial Transit Oriented Development (TOD) around station areas. Some of the alternatives used the I-580 median to a terminal station at Greenville Road, while others dipped south from the freeway median to go through downtown Livermore. Two-station extensions were investigated using conventional BART, Diesel Multiple Unit (DMU), and Express Bus technologies; short-line versions that stopped at Isabel or Downtown Livermore were also investigated. One of the alternatives are shown on the opposite page.

Phase 1 Alternatives Analysis

Since the existing Dublin/Pleasanton station already captures a very high percentage of BART's potential market among Livermore and Central Valley residents, none of the proposed alignments resulted in a significant gain of new transit riders. While the project would decrease the peak congestion period by up to 11 minutes, much of the new capacity would "refill" with "latent demand" that currently travels outside the peak period. Moreover, the costs of all of the rail extensions were too high, and the ridership too low, to justify pursuing them at this time. Even with substantial Transit Oriented Development around potential station sites, the alternatives have difficulty competing against other Bay Area transportation projects based upon the Metropolitan Transportation Commission's and the Federal Transit Administration's funding criteria and BART's System Expansion Criteria.

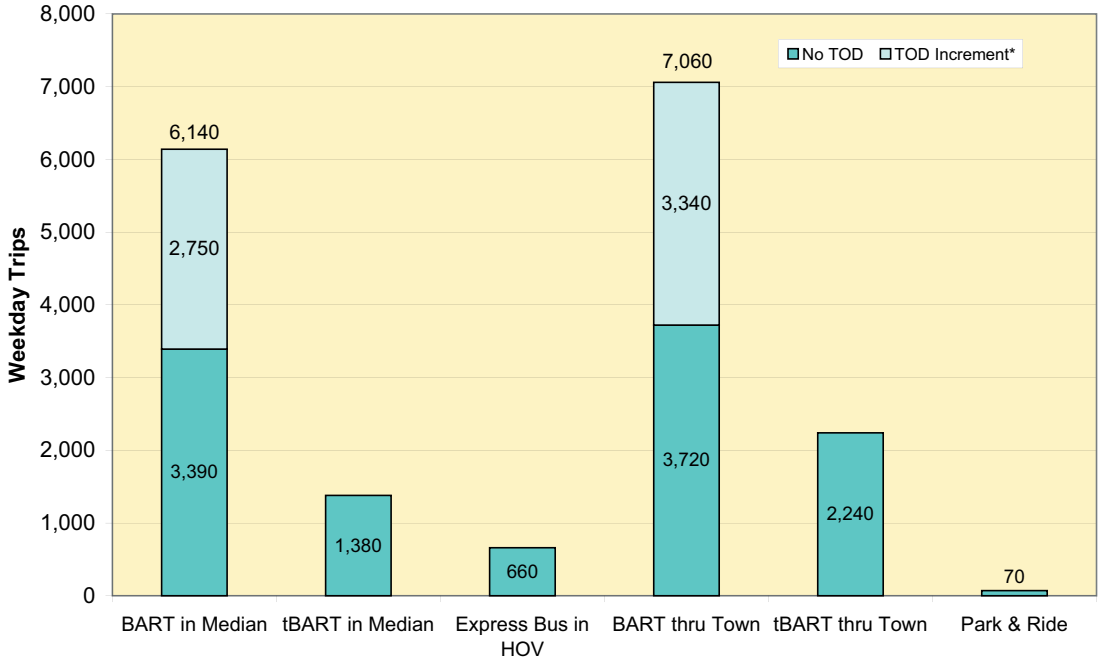
The Policy Advisory Committee voted to recommend the I-580 median as the preferred alignment for a BART extension, citing concerns about traffic and noise impacts in downtown. However, the Committee asked staff to examine other transit opportunities based upon the findings of the Phase 1 study.

Figure 1-3
Phase 1, Alternative 1: BART along I-580 Median



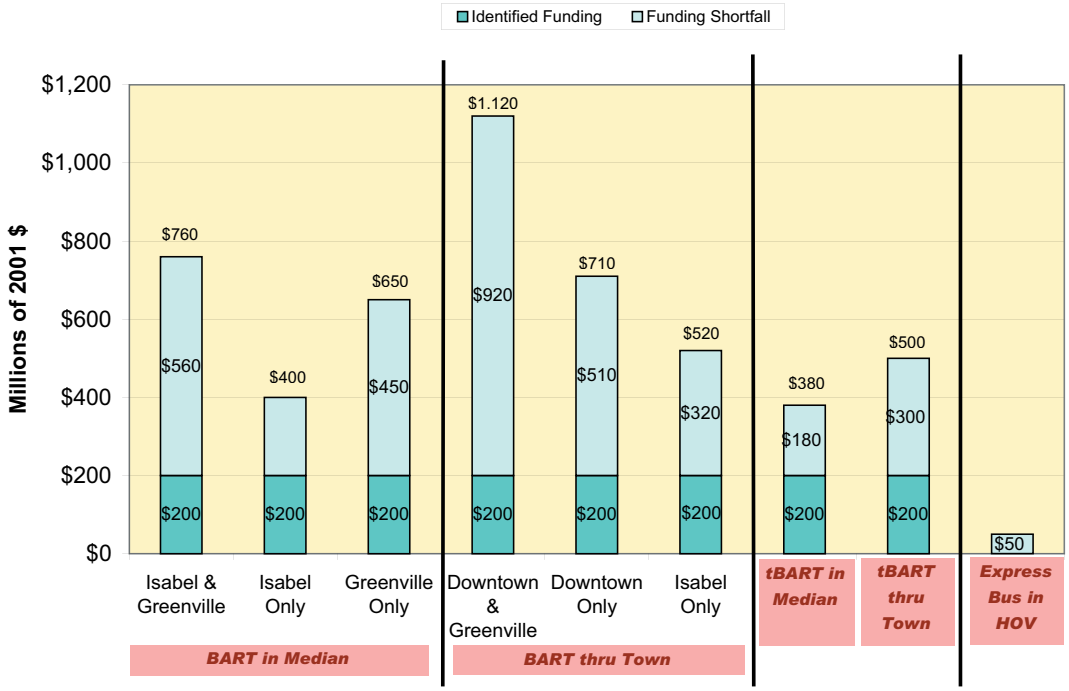
Source: Cambridge Systematics, I-580 BART to Livermore Study

Figure 1-4
Phase 1 New Daily Transit Trips in 2020



** Assume TOD covers 1/4 square mile*

Figure 1-5
Phase 1 Project Costs



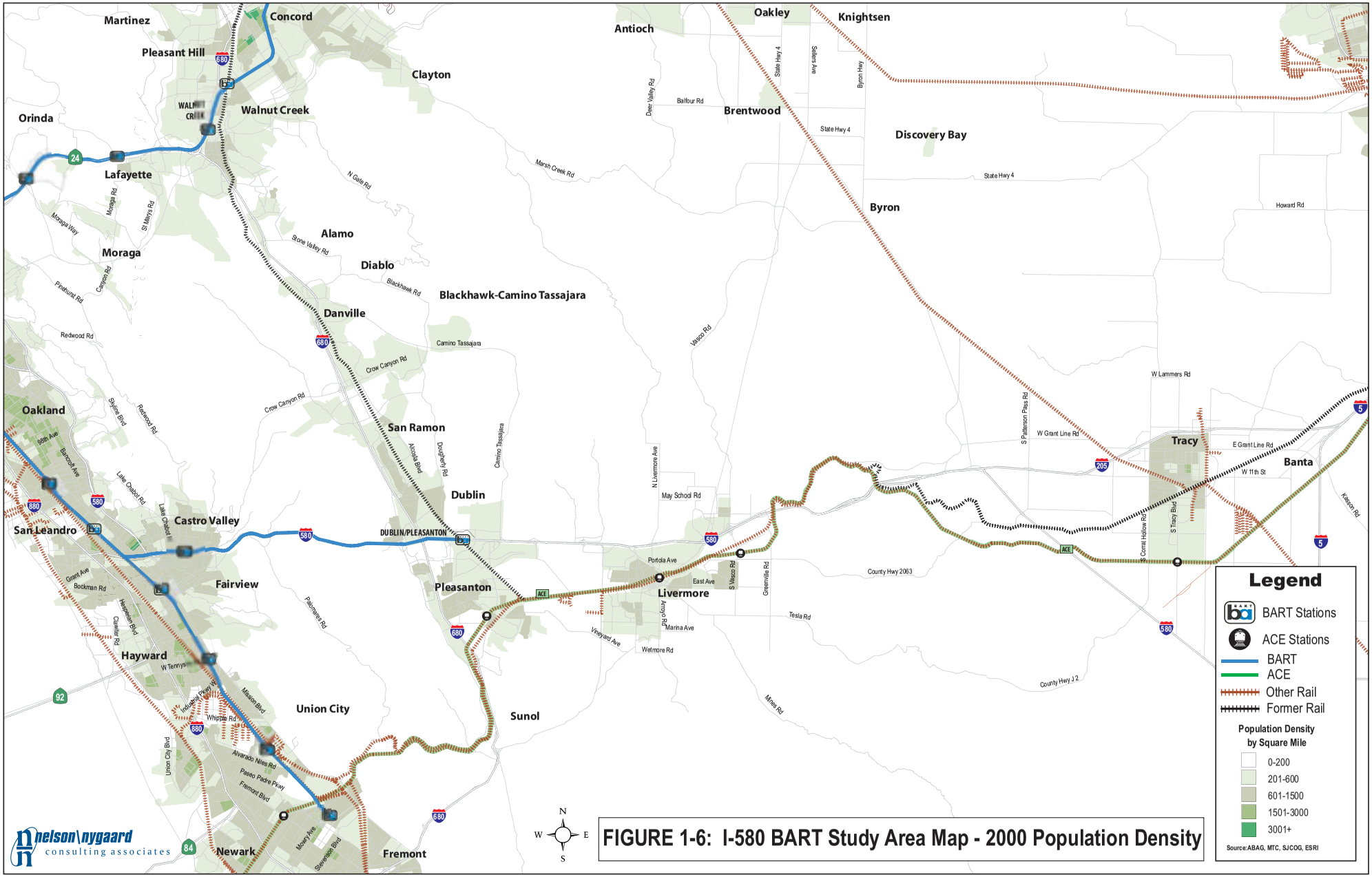


FIGURE 1-6: I-580 BART Study Area Map - 2000 Population Density

Transit Technology

Four primary transit technologies were explored in Phase 2:

- Conventional BART
- Federal Railway Administration compliant Diesel Multiple Unit trains, or "Heavy DMU"
- Non-compliant Diesel Multiple Unit trains, or "Light DMU"
- Bus Rapid Transit

These technologies are described in more detail below.

BART

BART is the most familiar modern rapid transit technology in the Bay Area.

Conventional BART train

Advantages:

- **Frequent, rapid connections to all inner Bay Area cities,** including San Francisco, Oakland and San José (planned by 2020 within the timeframe of this study)
- **High quality service, with padded seats and sleek exteriors**
- **High Capacity**, with up to 700 seated passengers per 10 car train
- **High Reliability** assured by separate right-of way

Disadvantages:

- **Non-standard gauge, train control system and other features** make it incompatible with other rail systems
- **Electric third rail** requires total grade separation of system, adding significantly to costs.
- **Long trains require long stations** that must also be separated from city streets, adding both cost and environmental impacts

Advantages

- **Can run on freight tracks,** resulting in major cost savings and the potential for expandability.
- **High speed** (>80 mph).
- **Allows for low-cost extensions to Modesto, Manteca, Stockton, etc.** Due to the extensive existing rail infrastructure connecting most cities in the Central Valley, it is likely the best technology for that market.
- **Compatible with ACE and Amtrak,** allowing for a coordinated transit network connecting the Bay Area and Central Valley.
- **Very cost effective** where rail tracks and capacity exists.
- **Lighter, quieter and faster acceleration** than locomotive-pulled passenger rail.

Disadvantages

- **Limited mixing with auto traffic in city streets,** unlike light rail technologies.
- **Lower acceleration** (0.8 – 1.5 mphps) than Light DMU.
- **Cannot make as tight of turns as light rail.**
- **Not yet in revenue service,** although several installations are in the planning stage.
- **Extensive negotiations** necessary to gain access to the Union Pacific (UP) tracks.

"Heavy DMU"

"Heavy DMU" is a refined rail technology reinvented by Colorado Railcar. Like ACE, Heavy DMU trains are diesel-propelled and are compliant with Federal Railroad Administration crash-worthiness rules that allow them to share tracks with heavier freight trains. Unlike Caltrain, however, Heavy DMUs consist of several smaller, self-propelled vehicles. According to the manufacturer, they produce significantly less noise, vibration and other impacts than the locomotive-propelled ACE trains.

Colorado Railcar Heavy DMU

"Light DMU"

"Light DMU" trains are similar to the light rail systems in San Jose, Sacramento and San Francisco, except that they do not require overhead wires. Such vehicles are in use or funded in Ottawa, San Diego County, Baltimore, Salt Lake City and Southern New Jersey. Like "Heavy DMU," they operate on standard gauge railway, although they cannot operate simultaneously with heavier freight and passenger trains.

Bombadier "Talent" Light DMU

Advantages

- **Fast acceleration** (2.5 mphps) allows for more frequent stops
- **Can run in streets,** just like other light rail systems, allowing for more flexible operations
- **Can take sharp corners**
- **Moderate speed:** Up to 62 mph
- **In revenue service** in both the United States and Canada
- **May be the best technology for capturing intra-Tri-Valley trips** because faster acceleration allows for frequent station spacing

Disadvantages

- **Cannot share track** with freight, ACE, or Amtrak, requiring all new trackways to be constructed
- **Likely not the best technology for longer distance trips** and Central Valley trips, due to lower speed and high cost of extending dedicated track.

Advantages

- **Can use HOV lanes** at highway speed.
- **Can run in city streets and act like a regular bus** where dedicated right-of-way is not available.
- **Various feeder bus lines serving a broad area can turn into BRT on a major corridor,** allowing for one-seat rides even where dedicated right-of-way is not available for the entire trip.
- **Very cost effective where HOV lanes exist** or where dedicated lanes can be created within existing rights of way.
- **May attract riders at same rate as light rail** when high-end vehicles are utilized.

Disadvantages

- **Less popular appeal than rail**, due partly to lack of familiarity
- **High-end vehicles are expensive**: $750,000 to $1.1 million each
- **Cannot run on existing railways**
- **Need extensive dedicated right-of-way**

Bus Rapid Transit

Like Heavy DMU, Bus Rapid Transit (BRT) is an emerging technology, pioneered primarily in Europe, Brazil, Ottawa and Pittsburgh. New high-end vehicles developed in France closely imitate the look and feel of light rail, with low floors, well designed exteriors and optical guidance systems that ensure a smooth ride. The first North American installation of modern BRT is scheduled to begin service in Las Vegas in November 2003. Unlike the Phase 1 study, the Phase 2 study proposes using the high-end vehicles in service in Rouen, France, and planned for Las Vegas, since the French experience has shown that they attract riders at the same rate as light rail.

To be successful, BRT must be protected from congestion, running either in dedicated right of way, in a shared HOV lane, or utilizing transit preferential treatments on city streets such as queue-jump lanes and signal prioritization. The "trackway" consists of a line painted on the street that the optical guidance system uses to maintain the bus on course within a couple of inches.

Grassy BRT trackway planned in Eugene, Oregon

Irisbus Civis in operation in Rouen and planned for Las Vegas